

### **REMARKS**

Claims 1-20 were previously pending, of which claims 1, 7, 8, 17, 19, and 20 have been amended. Reconsideration of presently pending claims 1-20 is respectfully requested in light of the above amendments and the following remarks.

#### **I. Independent claim 9**

Claim 9 was rejected under 35 U.S.C. §103 as being unpatentable over Yamaguchi in view of Shih, et al. (US Patent No. 6,387,761 hereinafter referred to as "Shih"). Applicant respectfully traverses this rejection for the following reasons:

##### **1. Prior Art That Teaches Away From the Claimed Invention Cannot be Used to Establish Obviousness**

In the present case the Shih patent, by providing an annealing procedure with hydrogen gas to cure defects at the silicon substrate/silicon nitride film interface and forming a dielectric (insulator) layer such as silicon dioxide on top of the annealed silicon nitride film, clearly teaches away from claim 9. (See Shih, col. 7, lines 13-20). Claim 9 recites performing a hydrogen anneal procedure and forming a polysilicon gate structure on the hydrogen annealed nitrided silicon dioxide layer.

Since it is well recognized that teaching away from the claimed invention is *per se* demonstration of lack of *prima facie* obviousness, it is clear that the Examiner has not borne the initial burden of factually supporting any *prima facie* conclusion of obviousness. Thus, for this reason alone, the rejection under 35 U.S.C. §103 should be withdrawn.

## **2. The References Are Not Properly Combinable if Their Intended Function is Destroyed**

It is clear that the Yamaguchi reference and Shih patent are not properly combinable since, if combined, their intended function is destroyed. More particularly, Shih teaches an annealing process with N<sub>2</sub>/H<sub>2</sub> gas to cure any defects (such as dangling bonds) which may exist at the silicon substrate/silicon nitride film interface and forming a dielectric (insulating) layer of silicon dioxide on top of the annealed silicon nitride film. (See Shih, col. 7, lines 13-20; Figs. 4b & 4c).

In contrast, Yamaguchi teaches forming an insulating layer of silicon oxide on the surface of the silicon substrate and forming a silicon nitride film on top of the silicon oxide insulating layer. (See Yamaguchi, pars. [0041 & 0042]). A plasma nitridation process is performed on the silicon nitride film in addition to an annealing process. (See Yamaguchi, pars. [0044, 0048, & 0049]). During the plasma nitridation process, the nitrogen radicals and nitrogen ions entering the silicon nitride film terminate the dangling bonds, thus, reducing the leakage current of the gate insulator made of the silicon oxide and the silicon nitride film. (See Yamaguchi, par. [0048]).

The Office Action stated that it would have been obvious for one skilled in the art to modify Yamaguchi's annealing process by adding H<sub>2</sub> because Shih teaches that annealing in N<sub>2</sub>/H<sub>2</sub> would cure defects such as pinholes and dangling bonds. (See pgs. 3-4, par. 4, Office Action). However, Yamaguchi's plasma nitridation process already cures such defects and the additional annealing process of Yamaguchi, conducted in an atmosphere comprising a passive gas, is intended to prevent diffusion of the nitrogen atoms towards the substrate interface. (See Yamaguchi, pars. [0049 & 0050]). Thus, since this modification of the Yamaguchi reference clearly destroys the purpose or function of the invention disclosed in the reference, one of ordinary skill in the art would not have found a reason to make the claimed modification.

Thus, for this mutually exclusive reason, the Examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. § 103 should be withdrawn.

**3. The Recognition of a Problem, or of the Source of the Problem, is Not Obvious Even Though the Solution to the Problem May be Obvious**

In the present case, it is apparent from a reading of the Yamaguchi reference and the Shih patent that neither recognized the problem of decreased etching selectivity for a gate insulator layer comprising of nitrided silicon dioxide, and as a result, the selective dry etch definition process caused unwanted pitting or damage to the underlying silicon substrate regions. Thus, this is a classic example of a solution to a problem being obvious only after recognition of the problem by the applicant and is part of the "subject matter as a whole" language of 35 USC § 103 which should always be considered in determining the obviousness of an invention under this statute.

Thus, for this independent reason, the Examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. § 103 should be withdrawn.

**4. The Combination of References is Improper**

Assuming, arguendo, that none of the above arguments for non-obviousness apply (which is clearly not the case based on the above), there is still another, mutually exclusive, and compelling reason why the Yamaguchi reference and Shih patent cannot be applied to reject claim 9 under 35 U.S.C. § 103.

§ 2142 of the MPEP also provides:

*...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made.....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.*

Here, neither Yamaguchi nor Shih teaches, or even suggests, the desirability of the combination since neither teaches forming a polysilicon gate structure on the hydrogen annealed nitrated silicon dioxide layer, as recited in claim 9.

Thus, it is clear that neither patent provides any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art for combining the references to support a 35 U.S.C. § 103 rejection. In the present case it is clear that the Examiner's combination arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claim 9. Therefore, for this mutually exclusive reason, the Examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

## **II. Independent claims 1 and 17**

For one or more of the reasons presented above with respect to claim 9, Applicant respectfully traverses the rejections of independent claims 1 and 17.

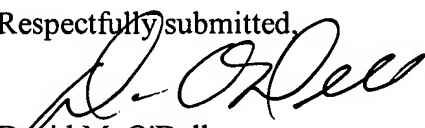
## **III. Conclusion**

It is clear from all of the foregoing that independent claims 1, 9, and 17 are in condition for allowance. Dependent claims 2-8, 10-16, and 18-20 depend from, and further limit, independent claims 1, 9, and 17 and therefore are allowable as well.

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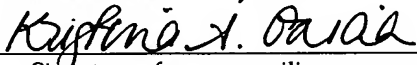
An early formal notice of allowance of claims 1-20 is requested. The Examiner is invited to call the undersigned at the below-listed telephone number if a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

  
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